



PIER Energy System Integration Program Area

Composite Reinforced Aluminum Conductor (CRAC)

Contract #: 500-00-003

Contractor: W. Brandt Goldsworthy & Associates, Inc.

Contract Amount: \$1,100,479

Match Amount: \$325,000

Contractor Project Manager: Michael Golden (310) 375-4565

Commission Contract Manager: Jamie Patterson (916) 657-4819

Status: Cancelled

Project Description:

The purpose of this project was to continue research begun under PIER contract number 500-98-035 with the same contractor. Under the first PIER contract, the contractor successfully completed a \$75,000 research effort to determine the feasibility of using a composite reinforced aluminum conductor (CRAC TelePower) in applications dominated by the standard aluminum conductor, steel reinforced (ACSR). This follow-on research was to develop prototype manufacturing technology for CRAC and demonstrate the conductor's performance on a 2,000 foot (nominal) 3-phase span using Southern California Edison's expertise. It was hoped that the new conductor would be capable of higher amp loading for the same cost as ACSR, and would also be able to carry digital and analog signals for communications and conductor diagnostic purposes.

Phase II was evaluating manufacturing process improvement concepts which could have fundamentally affected the CRAC-TelePower conductor price and quality. An example was to review the cost savings made possible with co-mingling the glass/resin material as part of the conductor manufacturing process. Another example was to review the feasibility of individually powder coating the fibers with thermoplastic matrix material at the bushing. This idea, if it had been proven feasible, may have created other clean manufacturing facilities in California that would have been able to supply the worldwide composites industry with a superior material system.

The goal of this project was to design, develop and demonstrate a transmission line with both power and data transmission capability. The project demonstration of this concept also included developing and demonstrating new manufacturing methods needed to make it cost-competitive. This technology could have potentially strengthened California's and the Nation's electric power and communications infrastructure. The research would have also enabled substantial environmental benefits because the technology would have resulted in the ability to reconductor existing lines with a conductor that transfers more power per unit of weight.

This project supported the PIER Program objectives of:

- Improving the reliability/quality of California's electricity by avoiding power outages caused by line sagging and swinging, high winds and ice buildup.
- Improving the energy cost/value of California's electricity by reducing losses and the costs of replacing conductors.
- Improving the environmental and public health costs/risks of California's electricity by reducing the need for new transmission lines and corridors.
- Improving the safety of California's electricity by significantly reducing the potential for line clearance violations.

Proposed Outcomes:

1. Beta-test CRAC manufacturing technology by producing sufficient, specification-grade CRAC-TelePower conductor to span three phases at 2,000 feet in a real-time power transmission demonstration.
2. Demonstrate the CRAC-TelePower combined power and data communication conductor in a 2,000 foot, 3-phase conductor span. Specific performance targets were:
 - Line Sag: Target is 20% less line sag over entire operating temperature range.
 - Ampacity: Target is 40% more "Ampacity" compared to ACSR (DRAKE).
 - Magnetic Fields: Target is 50% reduction in magnetic fields on the ground.
 - Damping: Target is increased damping under conditions of galloping and aeolian vibrations.
 - Data Transfer: At least 0.5°C accuracy with a spatial resolution of one meter (analog).
 - Fewer than 1 error bits per 109 bits (digital).
3. Determine the feasibility of manufacturing "CRAC TelePower" for \$1 per product pound.

Project Status:

The project reached the second objective. Unfortunately this contract was terminated in December, 2003 because the contractor was unable to perform the tasks necessary to complete the project. Shortly after the death of Mr. Goldsworthy in 2003, project personnel left the employ of the company and the company entered into bankruptcy proceedings.